IS 11579 (1986): Recommended practice for chromate conversion coatings on aluminium [MTD 24: Corrosion Protection]

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Indian Standard

RECOMMENDED PRACTICE FOR CHROMATE TREATMENTS OF ALUMINIUM

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Indian Standard

RECOMMENDED PRACTICE FOR CHROMATE TREATMENTS OF ALUMINIUM

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RECOMMENDED PRACTICE FOR CHROMATE TREATMENTS OF ALUMINIUM

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 15 January 1986, after the draft finalized by the Corrosion Protection Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Chromate conversion coatings are generally applied on aluminium as corrosion preventives, as base for paint, and as protective surface coatings having lower electrical contact resistance than anodized coatings. They may also be used to change the emissivity and absorption properties of the metal or may be dyed for identification purposes.

0.3 The recommendations made in this standard are expected to provide a coating of standard quality, which can be met consistently by good commercial practice.

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1. SCOPE

1.1 This standard prescribes the details of the chromate treatment process applicable to aluminium and aluminium alloys for production of chromate conversion coatings.

2. TERMINOLOGY

2.1 For the purpose of this standard, the following definition in addition to those given in IS : 3531-1983* shall apply.

2.2 Iridiscent Passivation — When a stable adherent chromate coating is formed over the surface of the basic metal by reaction with acidified dichromate solution under suitable *p*H and duration of passivation producing more than one or two interface colours, the passivation is termed as iridiscent passivation.

*Glossary of terms relating to corrosion of metal (*first revision*).

3. CLASSIFICATION OF COATINGS

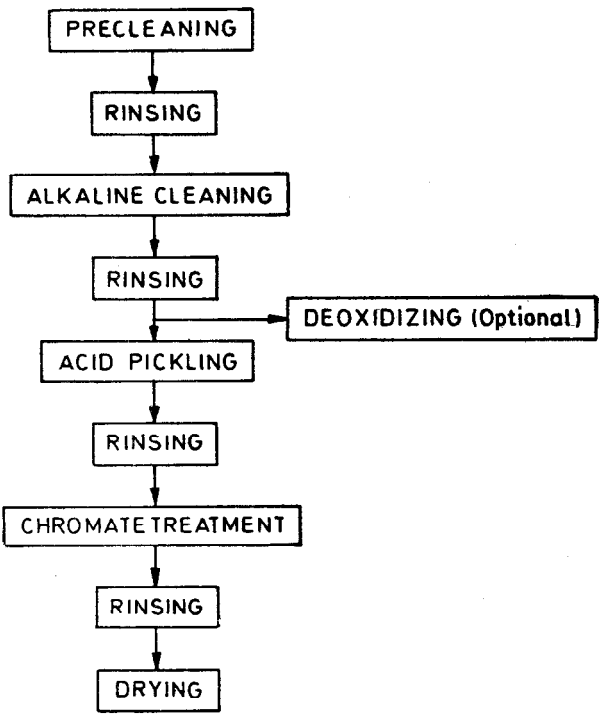
3.1 There shall be three classes of chromate coatings on aluminium as specified in IS : 11232-1985*.

4. BASE METAL

4.1 The base metal shall be free from visible defects, such as blisters, gouges, non-metallic inclusions, pits, or porosity which may be detrimental to the appearance and performance of the chromate film.

5. PROCEDURE

5.0 The following sequence of operations shall be carried out:



5.1 Precleaning — The aluminium surface shall be free of all foreign substances, such as grease, oils, paints, cleaning compounds and welding

*Specification for chromate conversion coatings on aluminium.

fluxes. Where oils and greases are particularly heavy, solvent vapour degreasing by means of trichloroethylene, petroleum solvent cleaning or emulsion cleaning may be used prior to alkaline cleaning.

5.2 Alkaline Cleaning — This is used to remove all traces of organic contamination. However, alkaline cleaning should be used with caution in respect of parts or assemblies, which are likely to entrap the alkaline solution as it might be difficult to rinse away all traces of solution.

5.2.1 For heat-treatable aluminium alloys, an acid deoxidizer pre-dip for about 1-2 min before alkaline cleaning is recommended to ensure uniform etch.

5.2.2 Alkaline cleaning may be carried out in non-etch or etch cleaners by immersion or electrolytic cleaning. The temperature of the cleaning bath, and the time lag between removal of the article from cleaning bath and subsequent rinsing should be so controlled as to avoid any drying of the cleaner on the article before rinsing.

5.2.3 There shall not be any kind of deposit left on the surface after cleaning, and the surface shall be free from any water breaks after the subsequent rinsing.

5.3 Deoxidizing — This step is optional and is generally used to remove any metal oxides, leaving the surface chemically clean and receptive for the chromate coatings.

5.3.1 In case a non-etch alkaline cleaner is used, an acid pickling is recommended for all heat-treatable wrought aluminium alloys. It is optional for non-heat treatable alloys and for die castings. If this step is omitted, thorough rinsing should be carried out before putting the article in the chromating bath.

5.3.2 Acid deoxidizing is usually required, when an alkaline etch cleaner is used. For alloys containing more than 1 percent silicon, a nitric-hydrofluoric acid mixture should be used. For all other alloys, a chromate type of deoxidizer may be preferable to nitric or other mineral acids.

5.4 Chromating

5.4.1 Chromate solutions are generally proprietary formulations, and the manufacturer's operating recommendations shall be followed. The solutions are generally acidic and contain hexavalent chromium salts, together with other salts which may be varied to affect the appearance and hardness of the film.

5.4.1.1 Typical chromating solution may contain 150 to 200 g of potassium sodium dichromate and 5·5 to 10 ml of concentrated sulphuric acid (s. g. 1·84) per litre. With the progressive use of the solution, the chemical composition of water will change. This will effect the film formation. Therefore the concentration of bath shall be maintained at the recommended level.

5.4.2 The limits of impurities in the water used for making up the chromate bath should not exceed 150 ppm of total dissolved solids, 15 ppm of chloride (as Cl') and 25 ppm of sulphate (as SO_4). If the impurities in the water used exceed these limits, it is preferable to use deionized or distilled water for making up the bath.

5.4.3 The concentration of the active ingredient of the bath shall be maintained within the limits of $\pm$ 10 percent of the initial value. The *p*H of the bath shall be closely controlled.

5.5 Rinsing — Thorough rinsing after every processing stage is essential. Rinsing may be carried out either by spraying with clean fresh water or by immersion in running water. Rinsing tanks may be agitated by passing clean air to ensure thorough rinsing.

5.5.1 Thorough rinsing before the chromating step is very important. It is recommended to rinse the articles by means of a counter current rinse or an immersion rinse followed by a spray rinse.

5.5.2 The chromated article shall preferably be rinsed in deionized water. If the final rinsing is done in hot water, the temperature shall not exceed 50°C. The time for hot rinsing shall be kept to the bare minimum and an adequate flow of water shall be maintained to prevent concentration of impurities by evaporation.

5.6 Drying — The chromated and rinsed articles may be dried by means of hot air, but it shall be ensured that the chromated surface does not attain a temperature of more than 50°C, as it may impair the corrosion resistance property of the film. It shall also be ensured that no foreign matter is transferred to the chromated surface.

NOTE — Chromate passivated coatings contain hexavalent chromium which may irritate the skin and cause ulcers on the skin. Necessary precautions, such as cotton, nylon or rubber hand-gloves shall be used to prevent skin ulcerations while handling chromated aluminium.

6. QUALITY AND APPEARANCE

6.1 The appearance and quality of the chromate coating should be uniform and substantially free of flaws or defects, which would be

detrimental to the appearance, protective value and bonding characteristics of the coating.

6.2 The colour of the coating and colour uniformity may vary between one alloy and another, and from a polished surface to an etched surface. Iridiscence and variations in colour intensity from one area of the surface to another are normal and should not be considered objectionable.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	$1\ N = 1\ kg.m/s^2$
Energy	joule	J	$1\ J = 1\ N.m$
Power	watt	W	$1\ W = 1\ J/s$
Flux	weber	Wb	$1\ Wb = 1\ V.s$
Flux density	tesla	T	$1\ T = 1\ Wb/m^2$
Frequency	hertz	Hz	$1\ Hz = 1\ c/s\ (s^{-1})$
Electric conductance	siemens	S	$1\ S = 1\ A/V$
Electromotive force	volt	V	$1\ V = 1\ W/A$
Pressure, stress	pascal	Pa	$1\ Pa = 1\ N/m^2$